EFFECT OF SEGMENTAL STABILIZATION EXERCISES VERSUS RHYTHMIC STABILIZATION EXERCISES IN SOFTWARE PROFESSIONALS WITH NON-SPECIFIC LOW BACK PAIN

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ABSTRACT
Segmental stabilization and rhythmic stabilization exercises both are effective in reducing back pain. The purpose of the study to find the comparative effect of SSE versus RSE on improving pain, functional disability and transversus abdominus activation capacity in software professionals with non-specific low back pain. An experimental design, selected 40 software developing professional with non-specific low back pain randomly divided 20 subjects into each group A and B. Group A received Segmental Stabilization Exercise and Group B received Rhythmic stabilization Exercise for four weeks. Pre and post intervention outcome measurement such as Visual Analogue Score, Modified Oswestry Disability Index Score and Transverse abdomenus capacity were measured. Analysis with ‘t’ test and Mann Whitney U test found that there was no statistically significant difference between Group A and Group B on improvement in means of VAS, MODI and Transverse abdominal capacity. However, the Group A found greater improvement in transverse abdominus activation capacity. Segmental stabilization exercise and Rhythmic stabilization exercise found to be effective in improving low back pain, functional disability and Transverse abdominal capacity for software professionals with non-specific low back pain.

Key words: Segmental stabilization exercise, Rhythmic stabilization exercise, Pain, VAS, functional disability, Transverse abdominus activation capacity, Software Professional, Non-specific Low Back pain.

INTRODUCTION
Low back pain is a major public health problem all over the world. Most people suffer incapacitating back pain at some stages in their lives. On any given day, an estimated 6.5 million people in the United States are bed-ridden because of back pain and approximately 1.5 million new cases of back pain are seen by physicians in each month. There has been growing concern about the low back disability in western society. In India, occurrence of low back pain is also alarming; nearly 60 per cent of the people in India have significant back pain at some time or the other in lives.

Low back pain is a common pandemic disorder which affects the lumbar spine, and is associated with substantial morbidity for about 80% of the general population at some stages during their lives. Although low back pain is usually a self-limiting and benign disorder that trends to improve spontaneously over time, the etiology of low back pain is generally unknown and the diagnostic label, “nonspecific low back pain”, is frequently given when no specific pathologic process or structure can be identified. Although low back pain resolves within a few weeks, approximately 10% of the patients develop chronic low back pain, which imposes large burden on society to the health care, and also absence from work, and lost productivity. Non-specific or common low back pain is defined as pain between the costal margins and the inferior gluteal folds, usually accompanied by painful limitation of movement, often influenced by physical activities and posture, and which may be associated with referred pain in the leg. It can be
Acute sub acute, chronic, and recurrent pain. Acute LBP can be defined as pain in the low back and/or sciatica of no more than 6 weeks duration. Sub acute pain is defined as pain between 6 and 12 weeks in duration. Chronic pain is defined as pain of at least 12 weeks duration.

There are several types of core stability exercises including Pilates exercise, Swiss ball programs, McGill’s stability exercises, balance board training, floor exercise programs, etc have been practice in treatment of LBP. These programs aim to restore the capacity (strength and endurance) of the trunk muscles to meet the demands of lumbo pelvic control, whereas the motor learning model described above aims to restore the co-ordination and control of the trunk muscles to improve control of the lumbar spine and pelvis. The programs may be used in a motor learning model as progressive training to rehabilitate the integration of the local and global systems for higher-level activities.

**METHODOLOGY**

As this study involve human subjects the Ethical clearance was obtained from the Ethical committee of KTG College of Physiotherapy, Bangalore as per the ethical guidelines for Bio-medical research on human subjects, 2000 ICMR, New Delhi. 40 subjects meet inclusion criteria; an informed consent was taken from all subjects randomized into 20 each in Group A and Group B. They were randomized by means of opaque envelopes written in 20 envelops as Group A for segmental Stabilization and remaining 20 envelops as Group B for Rhythmic stabilization.

Pre intervention outcome measurements such as severity of lower back pain was measured using Visual Analogue Scale, functional disability using Modified Oswestry low back pain Disability Index (ODI), and Transverse abdominal muscle activation capacity using Blood Pressure Cuff Unit (BPCU) and again same measurement were measured after four week of intervention.

TrA activation capacity was assessed by using the Blood Pressure Cuff (BPCU). The BPCU consists of a combined gauge/ inflation bulb connected to a pressure cell. It is a simple device that registers changing pressure in an air-filled pressure cell allowing body movement, especially spinal movement, to be detected during exercise. The cuff was placed on the TrA (above the anterior superior iliac spines and midline of the abdomen) while participants were in ventral decubitus over a rigid surface. The cuff was completely deflated. The positioning of the cuff was rechecked. The depression of the abdominal muscles over the spinal cord typically decreases the pressure by 4-10 mmHg. Subjects were instructed to do 3 trails on contraction of the transverse abdominus by asking them to “tuck their abdomen inside”. The change in pressure was rechecked. For final measurements cuff was inflated upto 40mmHg and subjects were asked to contract the muscle by doing tuck in procedure so that the subjects draw their lower stomach gently off the pressure sensor without moving the back or the hips and to sustain it for 10 seconds, measured by a stop watch. As the muscle contracting the pressure on the cuff reduces, the needle in the meter descends. When the needle becomes static during holding the measurement was recorded. Three final trails were measured after interval of 30 seconds, average of three reading were noted and used for analysis.

**STATISTICAL ANALYSIS**

Descriptive statistical analysis has been carried out in the present study. Out Come measurements are measured for pain using Visual analog scale in centimeters and functional disability using Modified Oswestry low back pain Disability Index (MODI) in percentage and Transverse abdominis activation capacity in mm/Hg of the subjects studied and presented as mean ± SD. Significance is assessed at 5 % level of significance with p value was set at 0.05 (1 tailed Hypothesis) less than this is considered as statistically significant difference.
Table 1: Age Distribution of the subjects studied

The above table shows that in Group A there were 9 subjects in age group between 21-30; 10 subjects in age group between 31-40 years, 1 subject in age group between 41-50 years and mean age of the subjects studied was 32.15 years. In Group B there were 9 subjects in age group between 21-30; 8 subjects in age group between 31-40 years and 3 subjects in age group between 41-50 years and mean age of the subjects studied was 32.85 years. There is no significant difference between mean ages between the groups.

Chart 1: Age Distribution of the subjects studied

The above graph shows that in Group A there were 45% of subjects in age group 21-30 years, 50% were in age group 31-40 years, and 5% were in age group 41-50 years. In Group B there were 45% of subjects in age group 21-30 years, 40% in age group 31-40 years, 15% in age group 41-50 years, 15% in age group 41-50 years.

Table 2: Gender distribution of Subjects

The above table shows that in Group A there were 7 females, 13 males, and in Group B there were 6 females, 14 males. The Fisher's Exact Test shows no significant difference between the gender distributions of the two groups.
The above table shows that the study was carried on total of 20 subject in each group consisting 7 females and 13 male subjects in Group A and in Group B there were 6 females and 14 male subjects with no significant difference in subjects taken between the groups with \( p=0.655 \).

**Chart 2a: Gender distribution of the subjects in Group A**

![Chart 2a](image)

The above graph shows that 35\% of females and 65\% of males were studied in Group A.

**Chart 2b: Gender distribution of the subjects in Group B**

![Chart 2b](image)

The above graph shows that 30\% of females and 70\% of males were studied in Group
Table 3: Analysis of pain, functional disability and Transverse abdominis activation capacity within the Group A (Pre to post test analysis)

<table>
<thead>
<tr>
<th></th>
<th>Pre intervention (Mean±SD) min-max</th>
<th>Post intervention (Mean±SD) min-max</th>
<th>Percentage change</th>
<th>t value^a (Parametric)</th>
<th>Z value^b (Non parametric)</th>
<th>95% Confidence interval of the difference</th>
<th>Effect Size (ES)</th>
<th>Significance (1-tailed) P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual analog scale score in cm</td>
<td>6.40± 1.09 (5 - 8)</td>
<td>2.90 ±0 .78 (2-4)</td>
<td>-54.68 %</td>
<td>20.571</td>
<td>-3.998 **</td>
<td>3.144 - 3.856</td>
<td>+3.69 Large</td>
<td>P &lt;0.000**</td>
</tr>
<tr>
<td>MODI in percentage</td>
<td>67.39± 2.53 (64.40 - 71.10)</td>
<td>14.19 ± 3.08 (11.10 - 20.00)</td>
<td>-78.94 %</td>
<td>51.893</td>
<td>-3.929**</td>
<td>51.054 - 55.345</td>
<td>+18.8 Large</td>
<td>P &lt;0.000**</td>
</tr>
<tr>
<td>Tr. Abd. activation capacity in mm/Hg</td>
<td>-5.00 ± 2.20 (2 - 8)</td>
<td>-30.20 ± 3.99 (24 - 36)</td>
<td>-40.20 %</td>
<td>-23.548</td>
<td>-3.928**</td>
<td>-22.960 - 27.440</td>
<td>-7.82 Large</td>
<td>P &lt;0.000**</td>
</tr>
</tbody>
</table>

The above table shows that there is a statistically significant change in means of VAS and MODI and Tr. Abd. activation capacity when means were analysed from pre intervention to post intervention within the group A with p<0.000 with negative percentage of change showing that there is decrease in the post means and with positive percentage of change showing there is increase in post means.

Chart- 3a: Analysis of pain on VAS scale within the group A (Pre to post test analysis)

The above graph shows that there is a statistically significant reduction in means of VAS when compared from pre intervention to post intervention in Group A.

Chart- 3b: Analysis of functional disability using Modified Oswestry low back pain Disability Index (MODI) within the Group A (Pre to post test analysis)

The above graph shows that there is a statistically significant decrease in means of MODI when compared from pre intervention to post intervention in Group A.
Chart- 3c: Analysis of Transverse abdominis activation capacity within the Group A (Pre to post test analysis)

The above graph shows that there is a statistically significant decrease in means Transverse abdominis activation capacity in mm/Hg when compared from pre intervention to post intervention in group A.

Table 4: Analysis of pain, functional disability and Transverse abdominis activation capacity within the Group B (Pre to post test analysis)

<table>
<thead>
<tr>
<th>GROUP B</th>
<th>Pre intervention (Mean±SD) min-max</th>
<th>Post intervention (Mean±SD) min-max</th>
<th>Percentage change</th>
<th>t value* ( Parametric)</th>
<th>Z valuea ( Non parametric)</th>
<th>95% Confidence interval of the difference</th>
<th>Effect Size (ES)</th>
<th>Significance (1-tailed) P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual analog scale score in cm</td>
<td>6.40±1.09 (5-8)</td>
<td>2.85±0.81 (2-4)</td>
<td>-55.46%</td>
<td>23.132</td>
<td>-4.018**</td>
<td>3.229 - 3.871</td>
<td>+3.69</td>
<td>P &lt;0.000**</td>
</tr>
<tr>
<td>MODI in percentage</td>
<td>67.39±2.53 (64.40 - 71.10)</td>
<td>15.75±5.75 (11.10 - 26.60)</td>
<td>-76.62%</td>
<td>36.113</td>
<td>-3.926**</td>
<td>48.647 - 54.632</td>
<td>-11.62</td>
<td>P &lt;0.000**</td>
</tr>
<tr>
<td>Tr. Abd. activation capacity in mm/Hg</td>
<td>-5.10±2.29 (2-8)</td>
<td>-15.60±3.47 (10 - 20)</td>
<td>-25.80%</td>
<td>-16.657</td>
<td>-3.946**</td>
<td>-11.819 - 9.181</td>
<td>-3.57</td>
<td>P &lt;0.000**</td>
</tr>
</tbody>
</table>

** Statistically Significant difference p<0.05; NS- Not significant; a. Pared t test. b. Wilcoxon Signed Ranks Test

The above table shows that there is a statistically significant change in means of VAS and MODI and Tr. Abd. activation capacity when means were analyzed from pre intervention to post intervention within the Group B with p<0.000 with negative percentage of change showing that there is decrease in the post means and with positive percentage of change showing there is increase in post means.

Chart- 4a: Analysis of pain on VAS scale within Group B (Pre to post test analysis)

The above graph shows that there is a statistically significant reduction in means of VAS when compared from pre intervention to post intervention in Group B.
Chart- 4b: Analysis of functional disability using Modified Oswestry low back pain Disability Index (MODI) within Group B (Pre to post test analysis)

The above graph shows that there is a statistically significant decrease in means of MODI when compared from pre intervention to post intervention in Group B.

Chart- 4c: Analysis of Transverse abdominis activation capacity within Group B (Pre to post test analysis)

The above graph shows that there is a statistically significant decrease in means Tranverse abdominis activation capacity in mm/Hg when compared from pre intervention to post intervention in Group B.
Table 5: Comparison of means of pain, functional disability, and Tr. Abd. activation capacity between the Group A and Group B.

<table>
<thead>
<tr>
<th></th>
<th>Group A (Mean±SD) min-max</th>
<th>Group B (Mean±SD) min-max</th>
<th>Percentage difference</th>
<th>t value(^a) (Parametric)</th>
<th>Significance(^a) (1-tailed) P value</th>
<th>Z value(^b) (Non parametric)</th>
<th>95% Confidence interval of the difference</th>
<th>Effect Size (ES)</th>
<th>Choën’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual analog scale score in cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>6.40 ± 1.09 (5-8)</td>
<td>6.40 ± 1.09 (5-8)</td>
<td>0%</td>
<td>0.000</td>
<td>p=1.000 (NS)</td>
<td>0.000</td>
<td>-0.701 - 0.701</td>
<td>0.000</td>
<td>Very Small</td>
</tr>
<tr>
<td>Post</td>
<td>2.90 ± 0.78 (2-4)</td>
<td>2.85 ± 0.81 (2-4)</td>
<td>1.73%</td>
<td>0.198</td>
<td>p=0.844 (NS)</td>
<td>-0.216</td>
<td>-0.462 - 0.562</td>
<td>-0.063</td>
<td>Small</td>
</tr>
<tr>
<td>MODI in percentage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>67.39 ± 2.53 (64.40 - 71.10)</td>
<td>67.39 ± 2.53 (64.40 - 71.10)</td>
<td>0%</td>
<td>0.000</td>
<td>p=1.000 (NS)</td>
<td>0.000</td>
<td>-1.620 - 1.620</td>
<td>0.000</td>
<td>Very Small</td>
</tr>
<tr>
<td>Post</td>
<td>14.19 ± 3.08 (11.10-20.00)</td>
<td>15.75 ± 5.75 (11.10 - 26.60)</td>
<td>-10.42%</td>
<td>-1.069</td>
<td>p=0.292 (NS)</td>
<td>-0.252</td>
<td>-4.513 - 1.393</td>
<td>+0.338</td>
<td>Medium</td>
</tr>
<tr>
<td>Tr. Abd. activation capacity in mm/Hg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>-5.00 ± 2.20 (2-8)</td>
<td>-5.10 ± 2.29 (2-8)</td>
<td>-1.98%</td>
<td>-0.141</td>
<td>p=0.889 (NS)</td>
<td>-0.154</td>
<td>-1.538 - 1.338</td>
<td>+0.045</td>
<td>Small</td>
</tr>
<tr>
<td>Post</td>
<td>-30.20 ± 3.99 (24-36)</td>
<td>-15.60 ± 3.47 (10 - 20)</td>
<td>63.75%</td>
<td>12.339</td>
<td>p=0.000**</td>
<td>0.000</td>
<td>12.205 - 16.995</td>
<td>-3.905</td>
<td>Large</td>
</tr>
</tbody>
</table>

** Statistically Significant difference \(p<0.05\); NS- Not significant \(a\). Independent t test b. Mann-Whitney Test

The above table shows that there is no statistically significant difference in pre and post intervention means of pain and function disability and pre intervention Tr. Abd. Activation capacity when compared between Group A and Group B there is a statistically significant difference in post intervention means of Tr. Abd. Activation capacity when compared between Group A and Group B.
Chart- 5a: Comparison of means of pain between Group A and Group B

The above graph shows that there is no statistically significant difference in pre and post intervention means of VAS scores when compared between the Group A and Group B.

Chart- 5b: Comparison of means of functional disability between Group A and Group B

The above graph shows that there is no statistically significant difference in pre and post intervention means of MODI scores when compared between the Group A and Group B.

Chart- 5c: Comparison of means of Tr. Abd. activation capacity in mm/Hg between Group A and Group B

The above graph shows that there is no statistically significant difference in means of pre intervention Tr. Abd. Activation capacity when compared between the Group A and Group B. There is a statistically significant difference in means of post intervention Tr. Abd. Activation capacity when compared between the Group A and Group B.
DISCUSSION

The present study found that Segmental Stabilization Exercise and Rhythmic Stabilization Exercises for non-specific low back pain in software professionals have shown statistically significant effect on improving pain, functional disability, transverse abdominus capacity after 4 weeks of treatment; however, the group who received Segmental Stabilization Exercise found greater improvement in transverse abdominus capacity than the group who received Rhythmic Stabilization Exercise.

Based on our findings that the study found that both the exercises SST and RST are effective in relate to software professionals with non-specific low back pain in improvement of VAS, MODI but in subjects who received SST we seen improvement in Tr Abd capacity. As there was no statistically significant difference in both the group the present study accepts null hypothesis.

CONCLUSION

The present study concluded that there is a significant effect in segmental stabilization exercise and rhythmic segmental stabilization exercise on improve of pain, functional disability and Transverse abdominus activation capacity. However, the segmental stabilization exercises found to be more effective in improving transverse abdominus activation capacity. It is recommended that considering both exercises in rehabilitation of non-specific low back pain for software professionals provided effective improvement.

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